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The Mysore Agricultural Journal

(The Organ of the Mysore Agricultural and Experimental Union)

Vol. XXVIII] January—March and April—June 1952 [Nos. 1 & 2

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THE CULTIVATION OF AVOCADO PEAR IN MYSORE STATE

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History

The history of the cultivation of Avocado dates back to the year 1819, when the East India Company, impressed by the suitability of the Mysore climate for introducing and acclimatising various fruit and other economic plants of Europe, introduced these plants in the Botanical Gardens, Lalbagh, Bangalore, which remained as a Branch of Bengal Presidency Garden under Dr. Waugh from 1819 to 1836 when the Garden was entrusted by the Governor-General to the Resident in Mysore, Mr. Cole.

Even though the varieties introduced since then are many, their cultivation is confined only to scattered trees in several parts of the Mysore State and in the Government and Palace Orchards. In spite of their successful cultivation, people do not feel encouraged to plant them out on commercial scale as there is no demand for the produce. Even in the Government concerns, the propagation of these plants is limited to meet the demands from the public as specimen plants and not to lose the variety in their collection. Therefore it is not possible to give an idea of the number of these scattered trees all over the State including the *malnad* area and the backyards of public buildings in some of the important towns of the State.

Varieties and Description

The following are the varieties now in existence in the Botanic Gardens, Lalbagh, Bangalore :

(1) *Persia gratissima* from Hawaii ; (2) *Persia gratissima* var. *Americana I.* pear-shaped ; (3) *Persia gratissima* var. *Americana II.* round-shaped ; (4) *Persia gratissima* var. *Americana III.* pear-shaped (the above three varieties from Washington) ; (5) *Persia gratissima,* Bangalore Palace seedling ; (6) *Persia gratissima,* Sri Lakshminarasappa's garden seedling; (7) *Persia gratissima* Lyan (Guatemalan) from Manila; (8) *Persia gratissima* Punky from Queensland; (9) *Persia gratissima* Hy. Guerte from Queensland; (10) *Persia gratissima,* purple-skinned; (11) *Persia gratissima* Goodwood from Queensland; (12) *Persia gratissima* Gangenhalli Estate Seedling I

(Mr. A. T. McIsaac); (13) *Persia gratissima* Gangenhalli Estate Seedling II; (14) *Persia gratissima* Mexican variety.

They are grown successfully with good results.

General

The Alligator pear also known as *aguacate, avocado,* midshipman's butter, etc., is the fruit of *Persea gratissima,* a medium spreading tree belonging to Laurel family (*Lauraceæ*), a tree native to tropical America but now widely grown throughout tropical countries. It is grown largely in Central America, West Indies, Mexico, Hawaii and California. The varieties differ considerably in form and range, from deep purple to pale green colour. Generally speaking they are like an egg plant fruit in size and appearance. The fruit is single-seeded, the fleshy edible portion being that between the seed and the skin. The flesh is of buttery consistency, of nutty flavour, cream-coloured and contains a large percentage of vegetable oil, in some cases stated to be as much as 18 per cent., very appetising and most nourishing, and is eaten by scooping the flesh out with a spoon and partaken either plain or flavoured with salt and pepper, the latter being the usual way. Though generally classified as a fruit, it is appreciated more as a salad than as a dessert fruit. The edible portion or pulp on an average constitutes 70 per cent., the seed 20 per cent. and the skin 10 per cent. of the entire fruit. According to Woods and Merril, who studied their chemical composition, water 81 per cent., protein 1 per cent., fat 10·2 per cent., carbohydrates 6·8 per cent., ash ·9 per cent., are the details of analysis. Soda, potash, magnesium and lime compose more than one half of the ash or mineral matter which places the Avocado among the foods which yield an ounce of the base-forming elements as opposed to nuts which furnish acid-forming elements in excess. Thus the Avocado is reported to contain twice as much mineral matter as that yielded by any other fruit and as far as protein in fresh fruits is concerned, the Avocado is stated to be in the lead.

The total dry matter in the Avocado is greater than that noted in any other fresh fruit. Due to the high percentage of fat in it, the idea of replacing meat by Avocado engaged the attention of some people in the past. It is also said that a good-sized fruit is quite sufficient to make a meal for the average man, and the natives of Mexico live almost entirely on the Avocado and it is claimed that with sufficient supply of the fruit, the world could do away with meat entirely. But as the use of this fruit is not yet popularised in our country, this fact is in the way of the spread of its cultivation on a commercial scale. The Avocado could be of great use in an agricultural

country like India where the *raiyat* has to save his cattle from the butcher.

Cultivation

The propagation is by seed. Budding or grafting would be preferable. The common local variety is a robust tree and admirably answers the purpose of a stock plant for the best Indian varieties. For an elevation of 4,000′ to 5,000′ the Mexican stock is required. The seed is large, often 2″ in diameter, germinates fairly rapidly and is ready for removal to permanent sites or for budding at six to eight months of age. Shield budding is recommended.

As the tree attains a moderate height of 20 to 25 feet the planting distance is usually fixed at 25′ × 25′. West Indian varieties being suited to an elevation of 1,000′ to 3,000′ in the moist regions and the Mexican varieties in places higher than that, but in either case dry atmospheric conditions will not permit successful cultivation of this plant. It should be borne in mind that *Avocado* is a rapid grower and a gross feeder and therefore requires good supply of manure before the monsoons.

A mature tree will be giving from a few dozen to many hundreds of fruits. Varieties producing very large fruits are considered to be good bearers. Four to five dozen fruits of big size and two to three hundreds of medium size can be considered as a good crop from a normal-sized mature tree. A full grown seedling tree may give nearly 1,000 small fruits. The plants begin to bear fruits when they are five years old.

Uses

The Avocado fruit is rich in fat and proteins but low in sugar content. Its oil is similar to olive oil and can be used for the same purposes. It has been known in countries where Avocado has been long grown that its fruit is a wholesome and highly digestible food. Wolfe and others said that an ounce of Avocado yields about 73 calories, which is nearly three times that of Banana, one-and-a-half times that of beefsteak and other meats, and three times that of several kinds of fish. And because of this and its low carbohydrate content it is a good food for diabetic people. Its iron content is about three times that found in other common fruits and, therefore, it is a good food for anæmic people.

In the Philippines the fruit is eaten with sugar and milk or in frozen form or as Ice-cream ingredient. Few people eat the meat off-hand. In the United States it is extensively used as a salad fruit because of its delicate, nut-like flavour and its smooth, buttery consistency. The Avocado should not be considered merely as a salad

fruit but as a substantial food which may be used in great many combinations. For it is also eaten off-hand, with the addition of lime or

lemon juice or salt or sugar only. Mashed and seasoned, the meat is used as sandwich filling or spread on salted crackers. Often it is also added to soup just before serving.

Possibilities of its extensive cultivation and intensive use

It is possible to increase the acreage under Avocado in Mysore State provided the cultivators are assured of demand for their produce and the use of the fruit is highly popularised. The Government of India have already advocated the use of this plant for planting in all Provinces and States as a subsidiary food crop and the intensive use of this fruit as a substitute for cereals and meat. And it is hoped that the public will not lag behind to utilise the plant for economic purposes, as a fruit, and as a staple foodstuff. A North American Horticulturist views the Avocado as one of the greatest undeveloped source of food which the tropics offer at the present day. The Avocado takes the place of meat in the dietary of the Central Americans. It is appetising, it is nourishing, it is cheap and is available throughout most of the year. When these last two conditions have been reproduced in our country, the Avocado will certainly become a staple article of diet with millions of people. The increasing scarcity of food and the fact that an acre of land will yield a larger amount of food when planted to Avocado than it will in any other tree crop known at present, assures the future importance of the Avocado industry in this country.

In view of its exotic origin, meagre information is found about this plant and with a view to furnish information to the interested growers, the varieties and the botanical description of the plant is given below.

VARIETIES

There are three Avocado races, namely, the West Indian, the Guatemalan and the Mexican types. Each of these types requires a different elevation for its development and possesses different characteristics as follows :

West Indian.—The fruit of this type has loose fitting with rather large seed. According to Stahl they contain 4 to 7 per cent. fat. The skin is medium thick and is always smooth and leathery. The seed coats are usually separate and the cotyledons are rough on the surface. The fruit stems are short.

Guatemalan.—This type has a thick woody rind, producing dull, large and rough fruits. The seed is small and invariably light fitting, the meat of which is drier than that of the West Indian. The surface of the cotyledons is smooth. It contains more fat—from 10 to 13 per cent., but less carbohydrates. The fruit is usually borne on long fruit stem. The young leaves are frequently reddish or bronze in colour instead of green.

Mexican (Persea drymifolia).—The foliage is anise-scented, small, and sharp at the apex. The fruit is small with thin, smooth

rind which generally adheres to the pulp and is of purplish black in colour. It contains a higher percentage of fat (from 12 to 15 per cent.). The seed is large with thin coats which are either separated or adhering to the cotyledons. The surface of the cotyledons is smooth.

DESCRIPTION OF THE PLANTS

(1) Common Name : Butterfruit, Avocado pear.

(2) Botanical Name : *Persea Americana,* Mill. (*Persia gratissima,* Gaertn.) West Indian and Guatemalan races (*Persea Americana* var. *drymifolia,* Mez.), the Mexican race.

(3) Natural Order : Laurel Family (*Lauraceæ*).

(4) Origin : Tropical America.

(5) Habit : Medium-spreading tree of an ever-green type.

(6) Leaves : Alternate, simple, entire, leaf-blades multiform, lanceolate, elliptic-lanceolate, elliptic, oblong-elliptic, oval, ovate and obovate. The apex almost blunt to acuminate, the base usually acute or truncate. The length of the blades is 3 or 4 inches and as much as 16 inches.

(7) Inflorescence : Axillary, racemes.

(8) Flowers : Profuse, small pale green or yellowish green in colour, both staminate and pistillate.

(9) Perianth-lobes : The usual differentiation into the whorls, calyx and corolla does not occur in the Avocado; more or less pubescent, heavily so in *Persea drymifolia,* sometimes almost glabrous in *Persea Americana.*

(10) Stamens : Nine, arranged in three series, the anthers 4-celled, dehiscing by smooth valves hinged at the upper end. Ovary : One-celled, single ovate, the style slender, usually hairy with simple stigma.

(12) Fruit : Variable in sizes, pear-shaped, oval or obovoid, colour yellow-green to crimson, maroon brown, purple and almost black. The skin thin in many varieties of *P. drymifolia;* in *P. Americana* thick, hard and woody in texture; seed single, large, oblate, spherical, conicle, covered by two seed coats, varying in thickness, often adhering closely to one another. Cotyledons normally two, occasionally three in *P. drymifolia,* white or greenish-white in colour, smooth or roughened on the surface.

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BLISTER DISEASE "KAJJI" OF GUAVA FRUITS (*PSIDIUM GUAVA*)

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The blister or scab disease of guava fruits (*Kajji*) is very common and widespread wherever guava is grown whether in orchards or backyards. It is particularly rampant on Allahabad variety, though it is seen to a lesser extent on the local variety of guava. Fruits of all sizes are attacked, resulting in great loss to the grower. It was difficult to ascribe the damage to any insect or fungus though the damage looked very much like a plant disease. Observations and experiments were carried out to find out the cause of this common disease the results of which are reported in this paper.

Cause of the Damage

The blister on guava is caused by a capsid bug by name *Helopeltis antonii* Signoret, which pierces its rostrum into the fruit for sucking the sap, the punctures resulting in the scab or "Kajji", commonly seen on the fruits. It has been found that two fungi—*Pestalotia psidii* Pat., and the conidial stage of *Glomerella cingulata* (Stonem), Spauld and *V. Schrenk,* invade into the tissue damaged by the insect (Hopkins, 1950) ; but they are secondary as they follow the insect injury and do not spread into the surrounding tissue, excepting on the immediate margin of the puncture. Patel, Kamath and Hingorani (1950) found that the fungus *Pestalotia psidii* Pat., when inoculated, developed scabs on wounded surface of green and ripe fruits, to a higher degree, than on unwounded fruits. They have stated that the wound in nature may be brought about by fruit flies, guava mealy scales and the *Arbela* caterpillar. The writer has not found scabs developing as a result of punctures caused by any of the above insects. It was doubtless *Helopelta* both in nature and in enclosures caused feeding punctures which later developed into scabs. The lesions produced by the feeding punctures of the bug resemble those produced by fungi and bacteria, and many a time the injury is diagnosed as fungus disease. Leach (1935) has shown that similar scab is produced on mango by another species of *Helopeltis,* and has "concluded that the necrosis of the tissue is due to the injection by the insect, of some irritant that diffuses through the cells from which the sap is sucked". In any case the exact role of the fungi mentioned above and whether the bug transmits them, are details to be investigated.

1. *Helopeltis anatonii*. 2. Guava fruits showing blisters, caused by *Helopeltis* when enclosed on fruits in the Laboratory. 3. Guava fruits showing blisters caused by *Helopeltis* in nature. 4. Healthy guava fruits.

Morphology and Life-history of Helopeltis antonii *Signoret, in brief* (Fig. 1)

The adult is a slender, reddish-brown bug belonging to the family *Capsidæ*. The legs are long and reddish. The antennæ are black; third joint of the antennæ much shorter than the second. The scutellar horn is yellowish, straight, perpendicular, cup-shaped at the apex but it is variable in size, colour and shape. The head is black; the pronotum is reddish and the abdomen greenish, with a whitish band at its base. The wings are dusky and extend far beyond the abdomen.

The presence of the ovipositor along the ventral tip of the abdomen of the female distinguishes it from the male, in addition to its being bigger in size. The adults have been found to live long for nearly 2½ to 3 months; and in captivity they lived for 7-10 days. They are active in the day during cooler hours, and when disturbed fly for short distances, but not far above the plants. They shun the sun and take shelter below the leaves and in shady places, thus making themselves not easily detectable. While piercing the rostrum, they separate their antennæ, and the body is lifted on the legs.

Copulation takes place immediately and intermittently after the adults emerge. The two sexes remain *in coitu*, in the opposite directions resembling copulation in moths, where the abdomens unite, with the head in the opposite directions. Copulation lasts for a fairly long time, occupying 2-3 hours. The pairs have been found *in coitu*, on the fruits in shady places, while the female continued to pierce its rostrum for feeding.

Breeding takes place in the monsoon months. Oviposition commences soon after fertilization. Eggs are deposited during the day and night, but more often at night. Situations selected are axils of young buds, young fruits, green and tender stems, leaf stalks and midribs. Egg-laying is spasmodic, 9-10 eggs being laid at a time. An adult female is known to lay about 50 eggs under normal conditions. They are laid in pairs, and their presence is indicated by two hairs. The eggs are elongate, oval, slightly bent and truncate at one end. They are deeply buried in the tissue and are difficult to detect except by the stiff hairs which project out of the egg puncture. The incubation period is about 6 days; but it varies extending upto about 14 days.

The nymphs after emergence are amber-coloured, spider-like, wingless and soon begin to feed. Eyes are red, and the first instar nymph lacks the characteristic scutellar horn. The antennæ and legs are very long when compared to its body. Small hairs are seen on the body which disappear as the nymph becomes older. It molts 4 times, each time with an interval of 3-4 days. In the second instar, the

scutellar horn appears; and wing pads in the third instar. They become prominent in the fourth instar, with reddish dark eyes. After another molt, the nymph assumes the adult size and shape with dusky wings, and band on the abdomen.

The nymphs are very active and sometimes seen together in the cup of the flower-petals. They easily escape attempts to catch them. They become full-grown in about two weeks. If food plants dry up, they die soon of hunger. The habits appear to be the same in all the nymphal instars.

Nature of Damage

All the nymphal instars and the adults feed on fruits of all sizes including the ovary of the blossoms, tender leaves and green and tender stems. They pierce their rostra and make feeding punctures for sucking the sap from the fruits and other parts of the plants. Each puncture results within a few hours, in a brownish and later on black, round or angular spot. Each of these spots becomes a little raised up, warty scab with hard and dry texture, which sometimes cracks; and blisters are formed. The puncturing deepens upto below the skin, and not deeper into the tissue. If the punctures are too many they coalesce and form small black patches. If this happens on the older fruits, they get deformed and cracked; if the fruits are young and small, they dry up and drop on the ground. Extensive drying up of ovaries and very young fruits is seen in some gardens. If the damage is on leaves, they curl up and wither; and it extends to the stems also. Attack is severe in low elevations and in shady places. Most of the injury is caused by the nymphal stages. A single nymph has been found to make as many as 58 tabs. Field observations on assorted sizes of fruits have revealed that the number of tabs on a single fruit, ranges from 6 to 162, the average being 74 (Fig. 2).

Host Range

H. antonii has extensive host range. In Mysore, the bug has been noted to damage in addition to guava, cashewnut, Avocado; elsewhere it has been noted on a variety of food plants. Rao (1915) and Ballard (1921) found that Nim shoots were frequently attacked by this bug. The former author has also found it attacking mahogany in addition to guava. He has stated that it is found on tea, cacao, cinchona in Ceylon. Wester (1914) found it to be serious on all Annonnaceous plants and mango. Van Hall (1914) listed its hosts to be tea, cinchona, kapok, pepper, tamarind, cinnamon, camphor and *Bixa orellana* in Java. In Nigeria, Golding (1945) found a closely resembling species of this bug damaging a large variety of hosts among which Solanaceous plants, *Cajanus* and *Ricinus* are the more important.

Incidence and Generations

This bug breeds in the rainy season, and has been found to make its first appearance immediately after the first showers towards the end of May, presumably the eggs of the previous generation hatching after the rains. They were found throughout the year in guava gardens, as the plants bear stray fruits, while they are in blossoms. Though most of the fruits ripen and are picked during August-September, the plants continue to bear smaller fruits and stray older fruits, and also blossoms of the next season. This condition is very favourable for the bug to continue throughout the year, though in small number in the absence of many fruits. Since the life-stages from egg to adult ocupy about a month and the adults live on an average for about a month or even longer, there would be more than one generation. The bugs have been noted during April, June and October.

Economic Importance

Extensive damage is caused by this pest to guava fruits even when the pest is in small numbers. Sometimes the number of injured fruits has been found to be out of proportion to the number of bugs. But as has already been stated, both the nymphs and adults puncture the fruits and a single nymph or an adult has been found to make not only numerous tabs on a single fruit, but also attack many fruits; hence the extensive damage, though the number of bugs found in an orchard is very small.

It has not been possible to assess the value of the loss in terms of money. But the damage by the insect results in ugly, warty and deformed fruits, in addition to a large number of them dropping while young; the market value of the warty fruits is much lowered.

As mentioned already, the injury is only skin-deep and the tissue deeper below is not damaged. If the punctures are only few in number, the fruits develop and ripen in the usual manner. The warts can be easily scraped off by a pen-knife and the fruit eaten. So the injury results not in the loss of food value, but in the reduction of commercial value. The damage that may be done to the alternate hosts, like the Avocado, mango, tamarind, cashewnut, nim, *Cajanus*, castor, in addition to tea and coffee, etc., which are all economic crops of great value, has to be considered in assessing the importance of the pest, and keeping it under check.

Control Measures

In the absence of any efficient natural enemies, recourse must be had to insecticidal control to check the pest. As the bug has been found to puncture fruits of all sizes, including the ovaries of flowers, tender leaves and stems, it is very necessary that a preventive spray

or dust must be given to the plants beginning from the blossom stage; and the treatment continued with an interval of about 2 weeks, till the fruits are fairly well developed. Any contact insecticide will kill the bug. Around Bangalore, a liberal dusting of Gammexane D 025 (gama isomer 0·6 per cent.) with wood ash 1 : 4 has been found to give good results, to the satisfaction of the growers. Spraying of DDT-550 (Guesarol—50% D.D.T.) 1 lb. in 16 gallons of water has also been advised and found to be good. Atkinson (1890) and Patterson (1913) have recommended kerosene emulsion for spraying on the nymphs diluting one part of emulsion with 9-50 (usually 12) parts of water. Dusting or spraying has to be done during still hours either in the morning or evening.

As the attack has been found to be severe in bushy and shady plants, it is advisable to trim the plants and sufficiently open up the interior of the bush to allow plenty of air and light so that the shelter for the adults and grown-up nymphs can be lessened.

Acknowledgments

Grateful thanks are due to Sri. S. V. Venkatarayan, Plant Pathologist, for help in examining the damaged fruits for the presence of fungus, and connected information; to Sri. P. Raghuram for preparing the photograph, to Sri. B. Krishnamurti, Government Entomologist, for helpful criticism and general guidance; and Sri. R. Narayanaswamy Raju, Field Supervisor, for helping the writer in the field work.

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PRACTICAL GOAT (MILK) KEEPING

H. A. Govinda Rao

Retired District Forest Officer

After the recent Great War, the whole world and particularly, our India, suffered a great deal on account of the scarcity of food materials. The food may consist of the cereals, grams, vegetables, milk; meat, fruits and other subsidiary food crops like tapioca, yams, groundnut cake, etc.

Next to the cereals and grams, the most important item of food material is milk. In cities and towns, the demand for milk is so great that not even 25 per cent. of it is being supplied. The milk adulteration is the recognised order of the day and more than 50 per cent. water is added to it, so much so people are paying a rupee for every two seers of water. In villages, most of the *ryots* are not particular about the use of milk. In the first place, they are not particular in producing more milk by breeding good milch cattle and the little milk produced is used for preparation of butter and ghee for sale. In many cases, cows are not milked at all fearing that the calves would be deprived of the full milk supply. In diary farms and cities, she-calves are preferred, whereas in villages he-calves are better taken care of and thereby the male cattle are better looked after at the cost of milch cows.

In cities and towns, maintaining a cow or buffalo is too costly and so inconvenient that many a willing person would not attempt to keep a cow or a buffalo. To solve the milk supply of cities and towns, and also to supplement the production of meat, the most important enterprise is for every house-holder to try to keep a good pedigree milch goat. It is an economic producer of milk and butter-fat and in many parts of India, the nanny goat is the poor man's cow. It has been found that four or five goats can be maintained as cheaply as one cow and with a comparatively larger yield of milk. In areas where fodder resources are limited and milch cattle cannot be conveniently maintained, the goat has very great possibilities, as it can thrive on all kinds of garbage, particularly vegetable and other green offal and grain sweepings. The goat has very great possibilities as it can thrive on a class of fodder on which other animals starve to death. Statistics show that whenever there is fodder scarcity, goats are least affected and might even increase in number. According to 1940 live-stock census, the number of goats in India is 59,369,261 and out of this,

Mysore State owns 3,572,586. These figures show that goats constitute an important section of the live-sock requiring our careful attention for their improvement.

The goat as a class has fallen into disfavour and is considered to be the worst enemy of man for laying bare all vegetation in hills and dales and thus indirectly helping soil erosion, a problem which is now in the forefront when any agricultural improvement is considered. But the fault lies not with the goat but with the keeper of the goat who has never cared for the improvement of its stock and has profited by grazing free on other's lands. All animal life under controlled grazing improves the grasses and vegetation by natural selection and the fertility of the soil is increased by the excreta of the animals. So is the case with goats with such high economic characters and they therefore require special attention and fostering care in increasing good pedigree milking goats.

The main advantages to be derived from the goats are :

(1) A number of well-bred does may be purchased for a small sum of money, thus assuring, with a proper breeding policy, a continuous supply of milk for family use the year round;

(2) Outlay for buildings and equipment is small;

(3) Most children become attached to goats and soon learn to care for them;

(4) Many people living in or near cities and towns can keep a couple of goats without being much inconvenienced for feed or stabling, thus saving for the most part the cost of the family milk supply;

(5) Growing children, who learn to love goats and care for them successfully, are likely to make a success with other live-stock.

Some of the good milching pedigree goats are "City Goats" because they stand confined to conditions and stall feeding well and do not walk long distances in search of food like most village goats.

There are some very good breeds of goats in India with high yield of milk and long period of lactation.

The following are some of the best breeds found in India :

(1) Surti; (2) Pateri; (3) Janna Pari; (4) Butal; (5) Kamoni; (6) Bar Bari; (7) Kathiawari; (8) Dera Din, Panch, etc., etc.

There are many different breeds of goats in British Isles and some of those goats are imported into India and are being bred here and there, but of late, scant attention is being paid to scientific goat breeding.

The indifference and neglect shown to goat-keeping in India is due to not having goat associations like Sheep-Breeding Associations all over the country, good educating propaganda by those associations

and animal husbandry departments. Even now it is not too late to start goat-keeping associations all over the country and especially in cities and towns to select, secure and distribute good breed pedigree milk goats among enthusiastic goat-keepers and through them spread the knowledge of the use of goat-keeping and thereby solve the milk supply problem to a great extent. Experimental goat-breeding stations should be established here and there all over the country so as to have one such station for each important breed. Besides serving as a distribution centre for pedigreed animals, these stations should conduct research on all aspects of goat husbandry and provide such information as may be useful in planning breeding policies for animals in dfferent areas or for different purposes. Practical information regarding preparation and feeding of cheap and efficient rations to increase the supply of milk should be gathered. Propaganda and visual demonstration in respect of improved methods of breeding and rearing should be carried out. Impetus to improve goats should also be given by granting subsidies to goat-breeders.

Now I want to say a few words with regard to the value of the goat's milk before I go to the subject of regular dairying with goats.

(1) T. B. Bacillus has not yet been found in goat's milk.

(2) Goat's milk is very rich in fat and its fat globules are smaller than those of either the cow or buffalo and, therefore, more easily digested—about 1 per cent. more fat than cow's milk.

(3) Cow's milk requires two hours for digestion, whereas goat's milk is digested in 30 minutes.

(4) Goat's milk is alkaline and cow's milk acid in action—a difference which may mean life and death to any one with a very weak stomach.

(5) Of the twelve different mineral salts found in the three kinds of milk, *viz.*, cow's, goat's and human, nine are to be found in the goat's milk and only six in cow's milk, but five in human milk, a difference of no mean importance.

(6) Cow's milk contains little or no iron whereas goat's milk has from 7 to 10 times as much of that very important element in the blood of all warm-blooded creatures.

(7) Potassium which has the most powerful affinity for oxygen of any known substance and takes it from every other compound, is present in goat's milk in about double the quantity present in cow's milk.

(8) Add to this iron content goat's milk has an oxygen-absorbing power such as no other milk has. On the addition of 5 per cent. sugar it becomes identical with human milk.

(9) Indians generally do not like goat's milk perhaps because of its odour and taste. This is entirely a matter of management. The peculiar taste is probably due to the goats being fed on bitter leaves like Neem leaves, *Vishamadhari* leaves, etc., and also to the presence of the male with the milking herd.

Thus has Chemistry shown us why the poor man's cow is so strong and vigorous and so readily adaptable to all climates and why her milk is so super-superior as a food and also as a therapeutic agent.

Apart from the above-mentioned merits of the goat's milk, the other economic uses of the goat are also to be considered : (1) Goat manure is richer in nitrogen and phosphoric acid than that of the cow or the horse; (2) Being a very prolific breeder and cheaply reared, its value as a meat-producing animal is also superior to many others; (3) Kashmiri and other Himalayan breeds give a special kind of wool. Even Rajaputana, Gujarat and Kathiawar supply goat's wool for making blankets, etc.; (4) India is the largest producer of goat skins in the world, producing 274·9 lakh pieces of skins annually. By the annual exported skins, India gets a sum of Rs. 273·3 lakhs; (5) In addition to the supply of various animal products, goats in the Himalayas are used as beasts of burden where mules and horses cannot perform this work.

Goat Husbandry

Before starting goat husbandry one must devote some thought to it and surely it is better to think first, rather than make mistakes and have to think afterwards how to remedy them. One must buy a complete set of all books on goat-keeping and study the pedigree and make plans accordingly. The intending purchaser must go to a breeder who has developed a strain of good milkers. He must see the Sire and Dam if possible and judge by the general excellence of the does and buck if the breeder has made selections for milk yield.

Always look for a doe that is well developed, that has a smart, intelligent appearance with a strong back, good feet and legs and mellow skin and fine hair. A heavy milker will be wedge shaped; that is, it will be sharp at the withers with compact well-laid-in shoulder blades, a good spring of rib, a large paunch and good depth of ribs indicating constitution, and good length between the hook and pin bones. The head of a good milking doe is refined and thoroughly feminine, the eyes are large and bright and the ears well attached. The neck is thin and fits smoothly into the shoulders, an indication of strength and constitution. The body should be well proportioned, but allowing plenty of room for the stomach. The hind quarters should be long and level and the thighs thin leaving plenty of room for a wide highly attached udder. The milk wells should be large and placed well forward. The

milk veins should be long and tortuous. The udder before milking should be full and well balanced, coming well forward in front and being attached high up behind. After milking the udder will be thin and elastic, giving no indication of fleshiness. The teats should be placed well apart having good length so that they be easily grasped in the palm of the hand.

A mild temperament is highly desirable in milk goats. Nervous goats are usually more difficult to feed and manage, being very often not so satisfactory for breeding purposes. When considering the total annual yield of milk one must not forget to take into consideration the number of days that the goat is in milk.

Breeding

The period of pregnancy for goats is 147 to 152 days. Kids of fifteen to eighteen months old may be allowed to mate although they come in season about a year after birth. This is manifested by the redness and swelling of the vulva accompanied by a slight colourless discharge. The goat will also be restless calling frequently and wagging its tail. This condition continues for about two days and will recur every three weeks unless the goat is successfully mated. If the doe has to be taken some distance to the buck, it is usually advisable to have her with the buck for a couple of days.

During the period the goat is in kid a little more care should be taken of her. She should be given mild walking exercise. Goats generally become very heavily pregnant and naturally their inclination, therefore, is to stand or lie about.

The signs of pregnancy are many and varied, but the very earliest is the ceasing to come into season, and the goat becomes quieter in disposition and generally goes up a little in milk for two or three weeks. After this, there seems to be very little alteration in the goat's demeanour but milk yield begins very slowly to diminish and by the time she is half-way in kid her figure should begin to show her condition, but this varies greatly in different individuals.

Now that goats are bred so much for milk, they do not always dry off naturally, particularly if they are only going to have one kid, and as it is very necessary that they should have a rest before kidding, preferably about six weeks, some steps must be taken to get them dry; this is best done by milking them at irregular hours and not stripping. It has been advocated that where there is difficulty in drying them off all concentrated foods should be withheld.

When a goat does not dry before kidding she does not usually reach such a high daily yield in her next lactation, although the total lactation may be higher. While in kid the goat should be well fed as though she is not milking heavily. She has to prepare herself for her

next lactation and grow her kids. If she is allowed to get too thin before kidding, she will waste a good deal of the early part of her next lactation, putting on condition herself instead of using her food for milk.

Kidding

The experienced goat-keepers will have their suspicions awakened to the fact that kidding is fairly imminent by the goat having an increased appetite and eating hay in a peculiarly ravenous way. Goats usually show symptoms of kidding some two or three hours before it actually takes place. The first symptom is that the animal becomes fussy, calling to anyone who passes by. The udder is rapidly filling up with milk; the goat seems to have gone down in size. Her tail appears to be carried higher than usual and there are two decided hollows on each side of it which makes her hind quarters appear to slope very sharply and she will by now be getting more and more fidgetty, breathing rapidly or even panting. She shows evident signs of pain and keeps scratching up her bedding lying down, only to get up again in a few minutes as if she cannot find comfort anywhere and this performance is repeated time after time.

The thick starchy-looking discharge should always be looked upon as a warning that kidding is near. Straining will now begin and during which time a slimy mucus is exuded and this is quickly followed by the water-bag in which floating in water (*Liquor amnii*) is the kid. This bag must not be broken as it is really helpful in dilating the parts and making the passage easier for the kid's exit. When there are two or more kids, the second may come hind feet first, in fact, this happens so often in multiple births. Directly the kid arrives all mucus should be cleared away from its mouth and nose so that it can breathe freely.

After the kids have arrived the goat should have warm oatmeal drink. This is made by mixing two handfuls of fine oatmeal into a smooth paste and adding boiling water to it, stirring slowly all the time, then cooling it down to drinking temperature. The kids will now be ready for feeding and the goat glad to have her udder relieved. Make the kids to suck the colostrum.

As soon as the doe has kidded, she should be fed sparingly for a few days. No grain should be fed the first day. After 48 hours, the grain ration may gradually be increased up to a full ration and abundance of succulent feed in the form of roots or green leaves. For the first week kids should be fed ¼ pint milk four or five times daily. After the second or third week, oatmeal water or calfmeal and water warmed may take the place of part of the milk. After the third week

they should have bran or shorts. Kids are usually weaned when six to eight weeks old.

Feeding and Foods

It is usual in considering the question of the feeding of dairy animals to divide the rations into two distinct parts—the maintenance ration and the production ration, and they have their definite uses. The maintenance ration is used for mere existence, that is to say, to provide the energy for exercise, digestion, breathing and the ordinary functions of the body and to keep up the temperature of the blood.

The production ration is literally for the purpose as its title suggests to produce. It must be used for the growth of the young animal, the production of the milk, the formation and growth of the young in pregnancy and the production condition.

The feeding of the milkers is of the utmost importance and unless they are given suitable and sufficient food it is quite impossible for them to do themselves justice and produce the amount of milk which by breeding they are capable of yielding. For all practical purposes, a production ration of one part protem equivalent to four-and-a-half starch equivalent will serve our purpose. It will be advisable to make up the ration with several different ingredients as mixtures have been proved to give better results than single goods.

The following rations are palatable to goats and give good results :

Ration I : 7 lb. linseed cake,
6 lb. flaked maize or jowar,
6 lb. split beans,
3 lb. bran.

Ration II : 5 lb. groundnut cake,
9 lb. flaked maize or jowar,
3 lb. oats or broken wheat.

As regards quantities of food, each goat receives about 4 lb. of hay, 1 lb. of concentrated food, *plus* production ration according to yield of milk. Goatlings get 1½ to 2 lb. of concentrates daily if not in milk and more in proportion if in milk. Goats should be offered water three times a day.

Housing

A loose dealwood box 5′ × 3′ × 2½′ high would be enough accommodation for a milch goat.

The flooring should be spread with plenty of clean dry litter. The floor should be washed every day and kept clean. A milking bench would be very useful. The goats get accustomed to being milked on a bench and will jump up there immediately released for milking.

Ailments

Though goats are on the whole generally free from diseases, they occassionally have troubles and the following table of diseases, etc., would be useful.

(1) Abortion.

(2) Bronchitis.—Give inhalation of turpentine twice or thrice daily.

(3) Blood in milk—Give the goat a dose of epsom salt and cut down albuminoid ration. A liberal allowance of green food should be given.

(4) Colic.—A dose of 4 oz. of linseed oil should be given and the stomach and sides of the goat should be firmly but gently massaged.

(5) Colds.—Give a table spoon of Epsom salt with a teaspoonful of ginger.

(6) Constipation.—Give 4 oz. of castor oil with 4 oz. of linseed oil.

(7) Chronic Bloat.—A spoonful of powdered charcoal in feed daily.

(8) Diarrhœa.—A dose of 4 oz. of linseed oil and 2 oz. of castor oil should be given and about 3 hours later a dose of one tablespoonful of prepared chalk in a pint of warm water.

(9) Dysentery.—Administer castor oil and feed on good hay and thin *Kanji* (gruel). Give chalk as above and also 5 grains of sulphate of iron in water twice daily.

(10) Inflammation of udder or garget.—Rub udder with castor oil. Milk carefully and well and give 2 oz. of Epsom salt every day. Apply hot fomentation.

(11) Soreteats.—Wounds or scratches on udder or teats should be washed and dressed with carbolic acid.

(12) Worms.—Give a dose of 3 oz. of 1 per cent. copper sulphate solution. Wait for 10 days, then dose again. Another method is to give santonine. After any of these worm treatments a course of tonic should be given.

Some of the pedigree milk goats are found in India. Before an enthusiast begins goat keeping, he should know the characteristics and potentialities of existing indigenous breeds of goats of India so that he may be able to select such animals of a breed most suited to his requirements and local conditions. To fulfil this need, the Indian Council of Agricultural Research collected information on the existing breeds of goats in India.

Some of these breeds are described hereunder :

(1) Jamna Pari is the largest and most handsome of the long-eared goats of India. Its home is the land between the Jamna, Ganges and Chambal.

They are dual purpose goats combining milk and meat qualities. They have a pronounced Roman nose, short and flat horns and long, wide pendulous ears. They carry large udders and big teats, and show a large amount of "feather" between the thighs. They are very handy and active and, therefore, ideal for rough village conditions. The average milk yield during a lactation was 540 lb. in a period of 274 days. The average milk yield is 2-8 lb. per day. The highest recorded milk yield during a day is 8·4 lb. Their butter-fat percentage is very high, testing on an average 5·2 per cent. with a maximum of 7·8 per cent. The dry period on an average is about 108 days. These goats are not prolific. They usually kid only once a year and give birth to one kid.

(2) The Surti goat is a medium-sized, smooth-haired, white animal with small thin ears, big udder and a small head. Good specimens of this breed are met in many cities of Bombay Province especially in Surat, Broach, Poona and even in Bombay.

It is, as already said, a "City goat" because it stands confined conditions and stall feeding well and does not walk long distance in search of food as other goats do. It thrives best on all kinds of garbage, particularly vegetable and other green offal and grain sweepings. The origin of this breed is interesting. At one time, Surat was an important harbour on the West Coast for foreigners to call at. The Arab traders always carried a large part of their food in the form of live goats. This way some of the best bucks were brought to Surat. The resultant breeding and cross-breeding between Arab Bucks and local does developed into the present-day "Surti" goat. The Surti goat has a small head, small thin ears, small thin horns—it is at times horn-less—small hoofs and clean short hair. The breeding and milking properties of this breed require to be fully utilised and developed further. Milk from 3½ to 5 lb. a day is easily obtained and some have been said to yield up to 6 lb. a day. The lactation period is long, with a very short dry period. At each kidding, two kids are dropped usually, three are fairly frequent and four at a time is not a rarity. The kidding takes place twice a year.

(3) Pateri.—In Surat and Bombay, however, a superfine class of goats known as Pateri, a sub-breed of Surti is found. It is definitely hornless, wattleless, with small thin wafery ears and a big udder with two long teats. It is a picture of fineness and tenderness.

(4) Bar Bari.—The dwarf goat or Guinea goat of Central and Western Africa. In India they are found in an area around Alighar.

Systematic breeding work is done in Etah in Uttar Pradesh. They are small goats with fine bones and they show the typical wedge shape of a dairy animal. They carry large well-shaped udder and yield a large amount of milk for their size. They thrive best when stall fed and so should prove valuable for the confined conditions which exist in cities.

The average milk yield is 307 lb. during a lactation period of 227 days. The average daily milk yield during a lactation is 2·4 lb. with a peak yield of 3·12 lb. The highest recorded maximum yield recorded during a lactation is 781 lb. They can be bred at any time of the year.

The chemical composition of the milk of the goat is given below :

	Water	Fat	Sugar	Protein	Ash	Calories
Goat ..	86·88	4·07	4·64	3·76	0·85	..
Red Sindhi Cow	86·56	4·92	4·58	3·21	0·752	342
Buffalo ..	83·59	7·16	4·81	3·77	0·765	447

The protein content of goat's milk is slightly greater than that of the cow, whereas the casein content is less and the albumin and globulin content somewhat higher.

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THE FERTILIZER QUALITY CONTROL ACT:—A LEGISLATION INTENDED TO SAFEGUARD THE INTEREST OF THE RYOT OF THE STATE

Dr. S. V. Govindarajan

Agricultural Chemist

Manures and fertilisers are essential for maintaining the fertility of soils and for obtaining increased crop yields. Compared to manures which are usually of an organic nature and generally bulky, fertilizers which are of a mineral nature, contain weight for weight, a larger proportion of the plant foods and as such the latter are also referred to as concentrated fertilizers. The increasing realization that even small doses of such fertilizers can produce marked results on the crops has made these materials popular among our *ryots*. The need for increased production of food crops and the high prices that plantation crops and money crops like sugarcane, potatoes, onions, etc., command to-day are inducements for the *ryot* to use more fertilizers to obtain larger crop yields.

In normal practice it is necessary to apply fertilizers containing two or more plant foods in balanced proportions to obtain optimum crop yields and this is effected by the application of "compound" fertilizers manufactured as such by fertilizer manufacturers or else by using ready-mixed fertilizers composed of mixtures of fertilizers supplying the different ingredients as marketed by manure dealers. Since the requirements for the different plant foods vary not only with the crops, but also with differing soil conditions, different types of mixed fertilizers have to be used so as to avoid unnecessary wastage of fertilizer materials and also to get maximum returns from a particular dosage of fertilizer mixture. In view of this, it is usual to find a number of mixtures intended for different crops and also for different conditions of manuring for a particular crop. At times, the multiplicity of the manure mixtures available with the manure dealers is likely to appear confusing to the *ryot*.

To avoid the above situation, the obvious thing for the *ryot* to do in manuring his crop is to get the straight fertilizers supplying nitrogen, phosphoric acid or potash in the form of, say, ammonium sulphate, superphosphate or potash salts and to mix these in required proportions and to use them according to his requirements. However, under the present conditions of restricted supply, the ordinary *ryot*

cannot procure these straight fertilizers easily and even if he obtains these, the problem of mixing these in the correct proportions without proper technical advice crops up. Further, at the present time, compound fertilizers containing the different ingredients in fixed and known proportions, which will avoid difficulties of mixing and minimise uncertainty regarding dosage, etc., are not available to him.

To obviate the above difficulties, ready mixed fertilizers meant for food crops are distributed under the supervision of the Agricultural Department either directly or through the Co-operative Societies, and the quality and composition of these mixtures are more or less constant and guaranteed. In addition, private dealers in manures are supplied through the Department with straight fertilizers with which they can prepare and market mixed fertilizers meant for food and non-food crops. The firms, as mentioned earlier, prepare mixtures of different compositions and priced differently so as to meet the requirements of individual *ryots*. Under such conditions, the guarantee of the composition and the nature of ingredients present in the mixtures are likely to raise doubts in the mind of the *ryot*.

The value of a manure mixture is based upon the content of plant foods contained in it and unless the price charged by a dealer is commensurate with the composition, the *ryot* will not be assured of getting the proper value for his money. To ensure this, it is proposed to enact an order entitled the "Fertilizer Mixtures Quality and Price Control Order" and proposals are before Government to this end. When this order comes into operation, every manure dealer will have to guarantee the content of the different plant foods contained in a mixture and the price of the mixtures will be fixed only on the basis of the value of plant foods contained in them and allowing the dealers a small margin of profit for the incidental trouble taken by them in mixing, bagging and marketing these. And with regards to the different mixtures, their suitability for various crops, whether they be plantation, garden or food crops will be fixed only with the approval of the Department. Thus the *ryot* will be enabled to purchase mixed manures in the open market with the full confidence that these contain the plant foods in sufficient quantities to give value for his money and that he will be justified in using them for the crops recommended.

IMPROVED FERTILIZER PRACTICES TO BENIFIT THE GROW MORE FOOD DRIVE

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In the present emergency of food shortage, the need for production of more food from food crops has naturally focussed our attention on the various factors which influence yield of such crops. While it is recognised that production of crops are to a large extent controlled by different factors like supply of water, soil, climatic and seasonal conditions, quality of seeds, incidence of pests, etc., the soil factors are those which can be most easily influenced by human intervention.

The important conditions which control the fertility and cropping qualities of soil are three in number, namely, the physical, chemical and biological conditions. Provided that a land has good soil depth and adequate drainage, its physical nature can be improved to produce proper texture and tilth in the soil through tillage. The chemical and biological factors, such as are not linked up with physical factors and which can be improved by tillage operations, can be very largely influenced through applications of manures and fertilizers. The chemical factors chiefly relate to the supply of the nutrient elements needed for crop growth and the absence of harmful chemicals deleterious to plant growth. The biological factors relate to conditions like air, water and nutrient supply providing for the optimum activity of micro-organisms which perform very important functions in all normal and fertile soils.

Both the chemical and biological factors which together very largely decide the fertility of normal soils are thus controlled by the supply in the soil of the various plant food substances. These substances include organic matter and minerals containing nitrogen, phosphorus, potash, calcium and other minerals. Applications of manures and fertilizers which supply these elements can thus influence the chemical and biological factors and thereby help in maintaining and also increasing the fertility of soils. The adequate and effective increase through these means of the fertility of soils will ensure the production of larger yields of crops.

Manure and fertilizer treatments like other agricultural operations to be most effective and productive of best results have to be made in proper time and proper manner, and this apart from applications of the optimum dosages. At the present time when our *ryots*

FIG. 1. Phosphatic fertilizer being "placed" at plough furrow depth (about 3") through *sadde*.

FIG. 2. Placement of superphosphate at depth through *sadde* and sowing ragi seed in same furrows.

are rapidly becoming manure-conscious and aware of the advantages of manuring, the demand for manures has considerably increased. While this is a healthy sign for the production of more crops, the proper methods of their use have to be ensured if considerable loss and wastage of the manurial elements are to be avoided. The need for obtaining the maximum effect from these materials is greatest since the supply of manures and fertilizers is restricted and their cost, particularly of fertilizers, is high. Only the correct practices based on scientific trials can ensure that the best returns are obtained out of the plant food contents of fertilizers applied to the land and that their inefficient use and consequent wastage avoided.

During the past few years, work of ascertaining the most effective ways of using manures and fertilizers have been in progress in the Agricultural Chemistry Section of our Department and the promising results from these experiments are being recommended to the *ryots* for their trial and adoption. The results of recent experiments indicate that dosage is not the only factor which gives the best yield from a fertilizer application, but that for a given dosage, especially of nitrogenous and phosphatic fertilizers, the time and the method of their application to the growing crop are important factors. Below are given the details of the modified practices which are improvements over the prevailing methods of fertilizer applications and being definitely superior in their effectiveness, are being recommended for popular adoption.

(1) *Fertilizing Green Manures with Phosphate Fertilizers*

The usual method of application of phosphatic fertilizers is to apply these broadcast just before sowing the seeds or else before transplantation of seedlings. Phosphates, unlike nitrogenous and other manures, suffer from the disadvantage that they react with soil minerals and rapidly get converted into insoluble forms which poor feeders like the shallow-rooted cereal plants cannot utilise effectively. The result is that little response by way of increased crop yields is obtained from such treatments. The case is different with leguminous crops which are equipped with a deep root system and being strong feeders on phosphates appear capable of absorbing to a much larger extent the added phosphates. Phosphates stimulate the growth and activity of micro-organisms associated with the root nodules of legumes and the increased activity of these organisms enables larger quantities of nutrients being absorbed by the plants. While a larger quantity of green matter is produced from leguminous plants fertilized with phosphates, their content of nitrogen, phosphate and other minerals is also found to be larger. These observations are made use of in increasing the effectiveness of phosphates to a cereal crop like paddy by raising a luxurious

leguminous crop fertilized with phosphates, and using same as green manure for the succeeding cereal crop. Experiments conducted during the recent years indicate that applications of superphosphate or bone-meal at ½ to 1 cwt. to the acre increase the green matter yield of groundnuts, sunnhemp and dhaincha by 20-50% and that the use of these as green manure to paddy without further applications of phosphatic fertilizers give superior crop yields than treatments involving applications of same dose of phosphates directly to the paddy crop. The improved practices yield 20-30% more yield of paddy crop and hence are definitely advantageous.

(2) *Placement of Phosphatic Fertilizers*

As mentioned earlier, phosphates suffer from the disadvantage that they react with various soil minerals and become insoluble. This results in their being rendered comparatively immobile, quite unlike the easily soluble nitrogenous fertilizers and thus become unavailable to plant roots excepting those in close proximity to the area of application. As such, the usual practice of broadcasting phosphatic fertilizers suffers from the serious disadvantage that the plant foods may not become available to a large part of the root system of even the shallow-rooted crops like cereals. These handicaps can be overcome by placing the phosphates below soil surface, approximately at the depths where the plant roots are concentrated, either before the seeds are sown or the plants transplanted or in some cases after the crop has come up. The "placement" gives large increases in crop yields and also results in economy in the materials used, since in many cases it is found that a fraction of the usual dose of phosphate fertilizer placed at proper depth can give as much yield as the full dose applied at surface. In the case of transplanted ragi grown under irrigated conditions, it is found that placement of the fertilizers 3"-6" below the surface gives 20-30% more yield of grain and straw. A convenient method of application is to drill the usual dosage of phosphates (½ cwt. superphosphate to the acre) through a *sadde* attached to a plough and to plant the ragi seedlings in the furrows thus made. The same technique can be followed in sowing of ragi grown under rain-fed conditions. The phosphate is placed at the proper depth by drilling through a group of 5 to 6 *saddes* attached to a plough and following this, the seeds are drilled in the same furrows through a second set of similar number of *saddes*. These operations are depicted in illustrations, Fig. 1 and Fig. 2. The above improved methods can thus be adopted with great advantage by our *ryots* without much difficulty and without involving any large variations in the present cultural practices.

(3) *Optimum Times of Application of Nitrogenous Fertilizers to Paddy*

It is now known that nitrogenous fertilizers applied on the surface to puddled or water-logged soils are largely lost to crops, on account of a variety of chemical and biological changes taking place in them. Hence, in the present practice of applying these fertilizers to paddy at the time of planting, there is considerable probability that the full use is not made by the growing plant of these plant foods. The young seedlings are not in a position to utilise the extra nutrients supplied and delay in their utilization results in loss from the puddled soils for the above-mentioned reasons. Delayed application of these materials till after the plant has established itself and after conditions in the soil have become more favourable for such applications, can thus be expected to give better benefit to the crop. Experiments show that organic nitrogenous manures like oil-cakes can be given to the paddy crop at the time of transplantation, and that the optimum time for application of mineral nitrogenous fertilizers like ammonium sulphate is 4 to 8 weeks after transplantation. The benefit is larger if the ammonium sulphate is given in two or more divided doses at intervals of 2 weeks. The increases in grain yield by these improved methods of application are found to range from 5 to 15% over the traditional method of applying the entire quantity at the time of planting.

STUDENT FARMERS' CLUBS

An article, 'Student Farmers' Clubs Get Started in Mysore', by B. Rudramurthy, has appeared in the previous issue of this journal, Vol. XXVII, No. 4. To further consider the popularisation of the movement, a Sub-Committee was set up by the Management of the Mysore Agricultural and Experimental Union. The salient points of the proceedings of the Sub-Committee are given below. The Kannada pamphlet referred to in the proceedings has been issued.

Proceedings of the Meeting of the Sub-Committee held on 29-1-1952 to Discuss the Question of Formation of Young Farmers' Clubs in the State

Members Present :

1. M. Mallaraj Urs, B.Sc., B.Sc. (Agri.) (Edin.), Principal, Agricultural College (*Convener*)
2. B. Choode Gowda.
3. P. Nagesha Rao.
4. B. Rudramurthy, M.Sc., M.S. (Iowa),
5. B. V. Venkatacharya, B.Sc. (Agri.)
6. M. Vasudevamurthy, B.Ag. (*Secretary*)

The purpose of formation of the Sub-Committee was explained to the members present by M. Vasudevamurthy. A beginning has already been made in Bangalore District and the Managing Committee thought that it would be a very good idea to form such clubs in other parts of the State as well. For this purpose, a Sub-Committee consisting of the members noted above, was formed by the Executive Committee of the Experimental Union, with the object of drawing up proposals for approval by the Executive Committee.

B. Rudramurthy then explained to the Committee, through several pahphlets he had brought from the U.S.A., where such clubs are in abundance, the objects and the method of formation of these clubs.

A Kannada manuscript prepared by B. Rudramurthy and M. Vasudevamurthy, based on the information collected from articles on the Young Farmers' Clubs in the U.S.A., Australia, and Jamaica, was read for the infomation of the members by M. Vasudevamurthy. After discussion, it was unanimously agreed that this manuscript may be first issued in the next number of the Union Journal to enable farmers throughout the State to have an idea of these clubs.

It was also resolved that 1,000 reprints of the article may be taken for distribution amongst the several bodies.

It was generally opined that to enable farmers in the villages to have a specific idea of the nature of work to be done, the details of a sample project now on hand may be published in the Union Journal.

It was opined that a letter may be addressed by the Director of Agriculture in Mysore, to the Director of Public Instruction in Mysore, explaining to him the objects of the Young Farmers' Clubs and requesting his co-operation in the formation of these clubs in each and every High School and Middle School in the State.

It was also resolved that the Director of Agriculture in Mysore may be requested to address the Director of Animal Husbandry Services in Mysore, requesting him to issue circular instructions to his district staff about the "Young Farmers' Clubs" movement. The local Veterinary Inspectors may be requested to give suggestions to the students taking up the projects and help them in judging animals, etc., when requisitions are received from the clubs.

With a view to give recognition to the students who take part in this activity connected with Agriculture, issue of badges and medals to the student-members would go a long way in popularising the movement. The Secretary, Experimental Union, then explained to the Committee that these badges have already been issued to some of the clubs in Bangalore District. The expenditure incurred on this account may be ratified by the Executive Committee. It was unanimously resolved to recommend to the Executive Committee that a separate amount may be set apart from out of the budget of the Union Funds for meeting this expenditure in future.

Publicity and Propaganda

The several measures to be adopted under this item were discussed. It was generally agreed that the Experimental Union Journal alone would not be adequate. It was opined that the model project at Nelamangala or any other centre to be published in the Experimental Union Journal may also be arranged to be published simultaneously in the Mysore Information Bulletin with necessary pictures, etc., so that it may reach a larger public.

Enrolment of Patrons

The success of these clubs depends to a large measure on the availability of seedlings, seeds, etc., for the young farmers to raise them successfully on their plots of ground. With a view to get the very best seeds and seedlings, it was resolved that the nurserymen and the leading agriculturists throughout the State may be approached to become patrons of the Young Farmers' Clubs. The Sub-Committee

recommend that circular instructions may be issued to all the Circle Officers to approach leading nurserymen and agriculturists through their district staff and enrol as many nurserymen and leading agriculturists as possible within their jurisdiction to become patrons of these clubs and donate seeds and seedlings free of cost to the extent possible to the club in their jurisdiction.

7. With a view to watch the progress made in making the scheme a success in the State, it was resolved that the present Sub-Committee may be made a permanent standing Sub-Committee.

CELEBRATIONS OF THE HARVEST FESTIVAL AT ABBUR

The following is the text of the speech delivered by the Hon'ble Sri. K. T. Bhashyam, Minister for Law and Labour, on the occasion of the celebrations of the "Harvest Festival" under the auspices of the Department of Agriculture at Abbur, Chennapatna Taluk, on the 30*th December,* 1951.

I am glad to be with you on this joyful occasion. "Harvest Festival" will readily catch the imagination of our people ; and it is worthwhile being popularised. This is the gay time of the year, cool and pleasing. What though to-day we are in the grip of a food crisis ? We know it is only transient and will pass almost unnoticed, the more easily so if we come together in work as in play and bring more land into cultivation and reap richer harvests by adopting newer and more profitable methods. We, who know how to take the rough with the smooth, will not be daunted by this crisis and nothing need come in the way of our enjoying ourselves on a happy occasion like this. To sit moody and curse others will not ease the situation. We must come together and work all the harder to gather bumper crops and tide over the crisis. We cannot do better than celebrate the "Harvest Festival" as we are doing to-day and resolve to emulate each other in the matter of increasing agricultural production. I wish to congratulate those in charge of this festival on their happy idea.

On an occasion like this many thoughts come to our minds. It was at these festivals that our elders cemented their friendships, forgot old feuds and developed cordial relations. Perhaps also the mood of joviality and happy contentment led them to make matches among their children. Perhaps also they talked of improving the village and the conditions of life. Undoubtedly the villagers gave sumptuously out of their harvests to the village servants and to those that were in need. They were in a generous mood, being endowed with plenty and being happy at it. Perhaps also they exchanged views and experiences, how one peasant grew more this year than he did last year, how another got rid of a pest that threatened his crop, how still another converted his dry land into wet or *bagayath*, and the like. Every farmer was a scientist in his own way and the results of his researches were passed on to others, enriching general knowledge and increasing the general income. The more income to the village the more money circulated among the villagers and the higher was the standard of life in the village. We may well follow the old example with great profit to ourselves and to the country.

Every farmer should try to grow more on his land. If it is only a dry land, he must try to grow the maximum quantity of crop on it. He must try to convert his dry land into wet or *bagayath*. The advantage of doing so is too obvious to need mention. Every farmer must use the knowledge available and apply it to his own lands. He must get the soil examined and ascertain what crops could best be grown thereon either as it is or with the help of manures and fertilisers. Fertilisers are useful but care has to be taken in their use. Excess may ruin the crop and perhaps the land also. Researches must be carried on. They are very valuable. In America they have found out a solution which if sprayed on a paddy field will kill the weeds and serve as manure for the paddy plant. That is a great stride forward in increasing agricultural production at lower cost. The finding of that solution has cost billions of dollars in experimentation but now that the solution has been discovered trillions of dollars are saved every year. Sometimes these researches are so simple and economical that their importance is not really recognised. In the Hosur Cattle Farm, a cow was yielding about 1½ seers per milking. It was given a gentle massaging both morning and evening for about ten minutes each time and as a result it was found to yield two seers rising up to 2½ seers per time. Every owner of a cow can now try this experiment and profit by it. There are varieties of experiments all of which must be tried and all beneficial results passed on to the people at large. That is how the general level of agricultural income has gone up in other countries—an example we may well follow.

Every farmer must maintain statistics so that he may measure his progress from year to year. So also should every village have its statistics. The value of statistics is being increasingly realised in our country and our agriculturists will do well to profit by maintaining statistics. It will help to economise in the cost of production and to increase the volume of production per acre. For instance hardly ten years ago we were content to grow about 30 tons of sugarcane per acre and we felt that 40 tons per acre was record production. But now with the steel plough, fertilisers, selected seedlings like H. M. 320, and C. O. 419 and the spray to avoid the borer and perhaps also with the use of green manures like sunhemp, gram, etc., our farms are growing easily 50 to 60 tons and are trying to reach up to 100 tons per acre. Six to eight pallas of paddy per acre is the average for the State. It need not be so low. In many places where only ten pallas were being grown per acre, we are now growing 20 to 30 pallas of paddy. You must all have heard of Shri Velliah Gounder of Salem who got the title of "Krishi Pandit" and some substantial rewards in the shape of a tractor and the like for the record production of 12,000 lb.

of paddy per acre which means about 700 pallas. That is almost unbelievable for us who have never grown more than 35 pallas per acre. It only shows the possibilities before us. We must never sit still but must go on experimenting and profit by the results of others experimenting. There are many small, almost insignificant, details each one of which is calculated to yield better results. They must be studied and applied by us. That is the way of life and that is the way of growth.

The Agricultural Department is ever ready to help us. We are maintaining it at the cost of lakhs. We have experts to assist us. We must avail ourselves of their assistance. We must build up agricultural co-operatives. The more forward among us may have to sacrifice a little in the beginning—and it is but a wee little—but as time progresses we shall be richly compensated by the general level of the people around us going up along with our own standards. I expect every genuine farmer to vote for co-operative agricultural production and to do every thing he can to promote his own welfare along with the welfare of those around him.

In inspiring high ideals of conduct and life and in enriching one's life with joy and work, both profitable and pleasant, this kind of "Harvest Festival" is an excellent hand-maid and I wish it increasing popularity throughout the State.

I thank you for the honour and the pleasure you have given me in permitting me to associate myself with this celebration.

310-32 Printed at The Bangalore Press, Bangalore City, by G. Srinivasa Rao, Superintendent, and published by M. Vasudevamurty, Secretary, Mysore Agricultural and Experimental Union, Bangalore City.